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ABSTRACT

This pamphlet touches on definitions of creativity; its manifestations and methods of measurement on the preschool, elementary, high school, and college levels; its pattern of development; non-test ways of identifying creative behavior; and an explanation of creative learning. Common blocks to creative development are delineated, and a section entitled "What Can Teachers Do?" offers some guidelines on how to provide opportunities for creative behavior, develop skills for creative learning, reward creative achievements, provide for continuity of creative development, establish creative relationships with children, and develop a supportive classroom atmosphere. Also included are prescriptions for determining goals in guiding creativity and a discussion of ways in which teachers may understand and increase their own creativity. General and selected research references are appended. (MF)

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WHAT RESEARCH SAYS TO THE TEACHER

28

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Creativity

E. Paul Torrance

ED 200 593

Association of Classroom Teachers
of the National Education Association

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is published to provide classroom teachers and prospective teachers with concise, valid, and up-to-date summaries of educational research findings and their implications for teaching.

Each pamphlet in the series is designed to serve two prime functions: to suggest principles and practical procedures that may be applied directly by the classroom teacher and to provide a springboard for further study and use of research findings.

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SIDNEY DORROS, *Series Editor*

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Creativity

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EXPLANATION

The author has attempted to draw from over 500 research reports on creative thinking the most valuable items for classroom teachers. In places, the text has emphasized the positive rather than attempting to identify the many gaps in our knowledge. Clearly there are great areas of ignorance concerning creativity (see *Creativity: Progress and Potential,* edited by Calvin W. Taylor, New York: McGraw-Hill Book Co., 1964).

The author is indebted to the New World Foundation of New York for supplementary support which enabled him to have free time for the preparation of this pamphlet.

The interpretations and recommendations are those which the author believes are supported by research or by expert opinion. The original draft was read by Alice Miel, Teachers College, Columbia University; J. W. Getzels, University of Chicago; Louise M. Berman, University of Wisconsin—Milwaukee; and J. Raymond Gerberich, University of Maryland. Although their suggestions were carefully considered, the author is responsible for the text in its present form. The manuscript was also reviewed and edited by the NEA Information Services.

CREATIVITY

THE DEMANDS of the times, national needs, recent discoveries, and a few sustained research efforts with some resulting accumulation of knowledge about the nature, measurement, and development of the creative thinking abilities have fostered among educators in all fields and at all levels an unprecedented interest in creativity. The urgent demands of the moment are reinforced by several quite legitimate concerns of long standing among educators. These persistent and recurrent legitimate concerns include such educational goals as the production of fully functioning, mentally healthy, well-educated, vocationally successful individuals. Recent research findings indicate strongly that these goals are undeniably related to creativity.

It now seems possible that many things can be learned in creative ways more economically and effectively than by authority. It appears that children *can* be taught in such a way that their creative thinking abilities are useful in acquiring even the traditional educational skills, that these abilities are different from those measured by traditional intelligence and scholastic aptitude tests, and that they are important in mental health and vocational success. Many educational leaders are seeing in these findings a demand for truly revolutionary changes in educational objectives, curriculuns, instruments for assessing mental growth and educational achievement, instructional procedures, counseling and guidance procedures, supervisory and administrative practices, and even in school building planning. Although the present accumulation of research findings concerning the nature, measurement, and development of the creative thinking abilities is far from adequate to tell educators what to do about developing creative talent, it does provide clues for classroom teachers.

WHAT IS MEANT BY CREATIVITY?

Creativity may be defined in many ways. It is usually defined in terms of either a process or a product, but may also be defined in terms of a personality or an environmental condition. The

author has chosen to define creativity as the process of sensing problems or gaps in information, forming ideas or hypotheses, testing and modifying these hypotheses, and communicating the results. This process may lead to any one of many kinds of products—verbal and nonverbal, concrete and abstract. Under this definition, it is possible to subsume the major elements of most other definitions. The production of something new or original is included in almost all of them. Creativity is sometimes contrasted to conformity and is defined as the contribution of original ideas, a different point of view, or a new way of looking at problems; whereas conformity is defined as doing what is expected without disturbing or causing trouble for others. Creativity has also been defined as a successful step into the unknown, getting away from the main track, breaking out of the mold, being open to experience and permitting one thing to lead to another, recombining ideas or seeing new relationships among ideas, and so on. Such concepts as curiosity, imagination, discovery, innovation, and invention are also prominent in discussions of creativity, and sometimes one or the other is equated with creativity. Some insist that every act of adaptation may be regarded as creative behavior.

We must recognize creativity in its many forms

When creativity is defined as a product, the results of the process are embodied in an invention, a scientific theory, an improved product, a literary work, a musical composition, a new design, or the like. In the child, it may be the discovery of a new relationship in nature (new to the child, at least), a song,

a poem, a story, or some unusual contraption or gadget. At the highest level, it is required that a creative idea be true, generalizable, and surprising in the light of what was known at the time the idea was produced. The U.S. Patent Office requires that a patentable device measure up to some standard of "inventive level" characterized by such qualities as a high degree of creative strength; usefulness in the sense of being a "stride forward"; and newness associated with overcoming a difficulty, prior failure to solve the problem, prior skepticism, and novelty of instrumentality. In a less stringent sense, these criteria can be applied to the productions of children and young people.

HOW IS CREATIVITY MANIFESTED AT DIFFERENT EDUCATIONAL LEVELS?

Early Childhood or Preschool Years

Many scholars have denied the possibility that young children can do productive thinking (producing something from what is cognized and remembered), and this has led to an overestimate of the child's receptivity. This misconception has led to an overemphasis upon the importance of providing a *stimulating environment* to the neglect of providing a *responsive environment*, an emphasis upon recall and reproduction to the neglect of problem solving, creative thinking, and decision making.

The confusion about the capacity of children for creative thinking has been increased by the tendency for each investigator to limit too seriously the range of his observations of creative manifestations. No single area of observation or test taps all of the child's resources for creative thinking, and the same test or kind of observation may not be equally valid or adequate at all age and educational levels. The beginnings of creative thinking may be found in the manipulative, exploratory, and experimental activities of the infant and the use of facial expressions, efforts to discover and test the meaning of facial expressions and gestures of others, and the like.

The Elementary School Years

Of the many manifestations of creativity during the elementary school years, greatest attention has been given to creative writing and art. We are now having a renewed recognition of the value of children's writing and art and discovering that children can be creative in a variety of other ways which are also important. Generally, educators of the past have considered children in the elementary and even in the high school years to be incapable of creative scientific thought. Thus, until recently the introduction of science into the curriculum has been delayed until high school, and even then it was taught as a body of accumulated knowledge to be transmitted by authority and not as a way of thinking or discovery and inquiry. The picture is now changing. Science has been added to the elementary curriculum in such fields as history, and children even are being taught the thinking skills of the historian. Similar developments will be forthcoming in anthropology, geography, psychology, and sociology.

The High School Years

A number of teen-agers have made history with their inventions, scientific discoveries, and other creative contributions. Among them are Arturo Toscanini, Wernher von Braun, Samuel Colt, Louis Braille, Galileo Galilei, and Edna St. Vincent Millay. Each year, a number of notable inventions and discoveries are credited to high school youths. High schools have long had provisions for recognizing creative writing and speaking talent and in recent years have begun making provisions for recognizing scientific and inventive talent. The following five manifestations are recognized in the Creative Science Scale used by the National Merit Scholarship Corporation in its work:

1. Giving an original paper at a scientific meeting sponsored by a professional society
2. Winning a prize or award in a scientific talent search
3. Constructing scientific apparatus on own initiative
4. Inventing a patentable device
5. Having a scientific paper published in a science journal.

The Creative Arts Scale gives credit for such manifestations as published poems and articles; awards in speech contests; prize-winning sculpture, ceramics, and painting; musical compositions and arrangements which have been publicly performed; dramatic performances; literary awards and creative writing prizes; and cartoons published in public newspapers or magazines.

College Years

Undergraduate college students have been known to produce almost all types of creative products such as inventions, medical discoveries, books, monographs, dramas, and operas. Usually, however, such accomplishments have been achieved outside of college requirements and sponsorship. Dissertations and theses, usually regarded as original contributions, tend to be evaluated in terms of correctness of methodology rather than in terms of originality, power, and worth of the ideas developed and tested. Through honors programs and other provisions for individual investigations, efforts are being increased to change this picture. Also, there have always been outstanding exceptions to the generalizations just expressed. Medicine, for example, has a rich tradition of important discoveries by undergraduate students (see General Reference No. 5).

HOW ARE CREATIVE THINKING ABILITIES MEASURED?

During the past 80 years or more, a variety of procedures have been developed for measuring some of the creative thinking abilities. Most of these measures have been used only in research, and only now are tests of creative thinking abilities becoming available for use in schools. It should be made explicit at this point that the weight of evidence indicates that creative thinking is not a unitary ability, but that a number of abilities are involved (see Nos. 7, 15, 16, and 17, Selected Research References, and Nos. 1, 7, and 13, General References). Thus, attempts to develop a single index of creative thinking or a CQ (Creative Quotient) should be avoided. According to the most extensive research in this field, the abilities involved are sensi-

tivity to problems, fluency (the ability to produce a large number of ideas), flexibility (the ability to produce a variety of ideas or use a variety of approaches), originality (the ability to produce ideas that are off the beaten track), elaboration (the ability to fill in the details), and redefinition (the ability to define or perceive in a way different from the usual, established, or intended way, etc.).

Types of Preschool Measures

Tasks or materials that have been used in eliciting creative responses from young children include drawing tasks, samples of scribbling, inkblots, imaginative play, picture tests, verbalizations while painting, and standardized problem situations. In general, there has been little relationship between these various measures of creativity and traditional measures of intelligence. Some investigators, surprised by such findings, have sought to explain away this lack of relationship, while a few recognized and accepted very early the genuine difference between the kinds of mental functioning involved in the two types of performance.

Measures at the Elementary Level

The variety of tasks used in assessing the creative thinking abilities at the elementary school level is great. Types of tasks include perceptions of inkblots; picture constructions from dots, circles, squares, parallel lines, incomplete figures, and shapes of colored paper; verbalizations while painting; symbolizations of words by lines; designs from standardized materials; ideas for product improvement (e.g., toys and common objects); consequences problems and asking and guessing; and guessing sounds or constructing images from sounds. Performances are usually scored for such qualities as fluency, flexibility, originality, and elaboration (Selected Research Reference No. 23).

Scores derived from measures of creative thinking have little relationship to performance on intelligence tests. Investigators have consistently urged the use of both types of measures in the identification and study of intellectual talent. Recent studies have shown that if we identify as gifted those scoring in the upper 20 percent on an intelligence test, we would eliminate about 70

percent of those who will score in the upper 20 percent on a measure of creativity. Unquestionably, some minimum level of intelligence is required for outstanding success of a creative nature, but this level cannot now be specified. Many research workers are convinced that cut-off points at 135 IQ and above, as used in most programs for intellectually gifted children, are too high. Several estimates place the minimal level at 120.

High School Tests of Creativity

The kinds of tasks for assessing the creative thinking abilities of high school students have been more restricted than for elementary pupils. Most of the measures used are group administered, use verbal stimuli, and require only verbal, written responses. Most widely used are Flanagan's *Ingenuity Test* and selections from the battery developed by Guilford.

Measures at the College Level

A variety of measures have been applied in research with college students. Some of the earlier tests involved word building, original analogies, puzzles, economic prophecies, consequences of novel situations, inventing, creating similes and metaphors, production of rhymes, picture and story completion, probable and imaginary situations, and the production of new combinations. In recent years, a number of new tests of creativity in the engineering and machine design field have appeared. Guilford's rather elaborate battery, the *AC (Sparkplug) Test of Creative Ability,* Burkhart's *Divergent Questions Test,* Fredericksen's *Formulating Hypotheses Test,* Mednick's *Remote Associations Test,* and others have been used in research.

Expanded Concept of the Human Mind

Perhaps one of the most important consequences thus far of the development and research use of measures of creative thinking has been an expanded concept of the human mind and its functioning. For many years, most people's concept of the human mind and its functioning was limited largely by the concepts embodied in intelligence tests. Developers of intelligence tests have not claimed that such tests assess all of a person's intellectual functioning. Yet, an intelligence or scholastic aptitude

test has almost always been used by schools and clinics as the sole index of a person's intellectual potential. If his achievement in some area fell below the level which would be expected from his IQ, he was said to be underachieving. If he achieved at an age level higher than would be expected from his IQ, he was somehow supposed to be overachieving. Curriculums and methods of teaching generally have been designed to bring about the kinds of growth or achievement related to the mental abilities involved in intelligence or scholastic aptitude tests. Tests of educational achievement likewise have been constructed along the same lines. This narrow concept of the human mind and its functioning has produced a kind of education which falls far short of our ideal of a humane education which will give all children a chance to realize their potentialities.

Current research involving programmed instruction is showing that such instruction can bring into play different abilities and different strategies of learning. In some experiments, post-program performance seems to be less related to mental age as measured by an intelligence or scholastic aptitude test than to performance on tests of originality. Many findings suggest that we may be discovering a few clues that will enable us to educate to a higher degree many people whom we have not been very successful in educating, such as the vast army of dropouts and other less educated groups.

WHAT PATTERN OF DEVELOPMENT DO THE CREATIVE ABILITIES FOLLOW?

From the best research evidence available and the observations of many investigators, creative imagination during early childhood seems to reach a peak between four and four and one-half years (see No. 1, Selected Research References) and is followed by a drop at about age five when the child enters school for the first time. Although this drop has generally been regarded as an inevitable developmental phenomenon in nature, there are now indications that this drop in five-year-olds is a man-made or culture-made phenomenon rather than a natural one.

Findings concerning the stages of creative development during the elementary years have been amazingly consistent, con-

sidering the variety of measures, samples of subjects, and periods in history involved. In the United States, most of the creative thinking abilities as measured by tests show growth from the first through third grades, a sharp drop at about the beginning of the fourth, a rise during the fifth and sixth, and another decline at about the beginning of the seventh grade (see Nos. 19 and 21, Selected Research References). The rise in the fifth grade, however, is primarily among girls and is in fluency rather than in originality. Some investigators have found that the seventh grade decline extends into the eighth, but the writer's own studies show a rise between the seventh and eighth grades, with continued growth until near the end of the high school years, at which time there is a leveling off or a slight decline.

Studies involving deliberate attempts to keep alive creative growth in the fourth grade and studies of the development of the creative abilities in cultures outside the United States all suggest that at least the drop which occurs in the fourth grade is a man-made rather than a natural phenomenon.

Non-test Ways of Identifying Creative Behavior

It will be some time before existing tests of creativity will be in common use. Many schools do not have school psychologists, counselors, or others qualified to use such tests. Also, a few children are not motivated to perform creatively on tests. Tests almost always have time limits, and creativity cannot always be hurried or forced. Some highly creative children have difficulty in writing their ideas, while others have special difficulty in communicating them orally. Thus, there is a need to continue to develop non-test ways of identifying creative talent.

Most teachers, however, have to redefine their customary concepts and values before they can identify creatively gifted pupils. When asked to evaluate pupils in terms of specific criteria of creativity, teachers generally report that this is the first time they have thought of their pupils in these terms. Much behavior that manifests the presence of creative talent is labeled by parents and classroom teachers as undesirable. One boy was so clever and ingenious in the way he cheated on a test that his teacher recognized his talent and was challenged to modify his teaching methods. The resulting change in the teacher's be-

havior was accompanied by dramatic changes in the boy's behavior and by the development of an outstanding talent.

One study revealed that the most frequently named non-test ways of identifying creative talent by teachers are indicators of curiosity, inquisitiveness, investigativeness, and penetrating questioning. One rather well-validated set of indicators of curiosity include "positive reactions to new, strange, incongruous, or mysterious elements in the environment (exploration, manipulation, etc.); exhibition of a need or desire to know about one's self and/or his environment; scanning of one's surroundings seeking new experiences; and persistence in examining and exploring stimuli in order to know more about them" (see No. 11, Selected Research References).

Other frequently listed non-test indicators include originality in behavior (e.g., unusual solutions, unusual answers, and unusual approaches to problem solving); independent, individualistic, courageous behavior; imagination (e.g., fantasy and storytelling); nonconforming behavior (not bothered by pressures to conformity); unusual perceptiveness of relationships; an overflow of ideas; experimentation; unusual flexibility in meeting emergencies; unwillingness to give up; constructiveness; daydreaming and preoccupation with an idea or problem; and going beyond assigned tasks.

As teachers gain a better understanding of creative behavior, they will be able to redefine many behaviors usually labelled as undesirable and to see in them an indication of abilities which give promise of highly desirable talents. The next step would be an acceptance of the challenge to guide individuals who possess such talents to apply their valuable abilities in creative, productive, socially valued achievements.

WHAT IS MEANT BY CREATIVE WAYS OF LEARNING?

In this writer's opinion, the weight of present evidence indicates that man fundamentally prefers to learn in creative ways—by exploring, manipulating, questioning, experimenting, risking, testing, and modifying ideas. Teachers generally have insisted that

it is more economical to learn by authority. Recent research suggests that many things, though not all, can be learned more effectively and economically in creative ways rather than by authority. It also appears that many individuals have an especially strong preference for learning creatively, learn a great deal if permitted to use their creative thinking abilities, and make little educational progress when we insist that they learn by authority. Such suggestions open exciting possibilities for better ways of individualizing instruction.

Learning creatively takes place in the process of sensing problems or gaps in information, making guesses or hypotheses about these deficiencies, testing these guesses, revising and retesting them, and communicating the results. Strong human needs are involved in each stage of this process. If we sense that something is missing or untrue, tension is aroused. We are uncomfortable and want to do something to relieve the tension. This makes us want to ask questions, make guesses, or otherwise inquire. Uncertain as to whether our guesses are correct, we continue to be uncomfortable. Thus, we are driven to test our guesses, correct our errors, and modify our conclusions. Once we discover something, we want to tell someone about it. This is why it is so natural for man to learn creatively. It seems so spontaneous that some people call it incidental learning.

Creative learning develops best under varied and informal methods

We learn by authority when we are told what we should learn and when we accept something as true because an authority says that it is. The authority may be a classroom teacher, parent,

textbook, newspaper, or reference book. Frequently it is majority opinion, the consensus of our peer group. In our democratic culture, there is a tendency to emphasize the rightness of the majority in determining the truth.

From these differentiations and from research evidence, it appears that learning by authority primarily brings into play on the part of the learner such abilities as recognition, memory, and logical reasoning—the abilities most frequently assessed by traditional tests of intelligence and scholastic aptitude. In contrast, creative learning involves such abilities as evaluation (especially the ability to sense problems, inconsistencies, and missing elements), divergent production (e.g., fluency, flexibility, originality, and elaboration), and redefinition.

Several well-known studies indicate that the creative thinking abilities can be important in educational achievement (see Nos. 5 and 16, Selected Research References). It appears, however, that these abilities are less useful in classes and in schools where teachers insist that children learn almost entirely by authority.

WHAT CAN TEACHERS DO?

At an early age many children appear to develop a preference for learning by authority. The human needs that make creative learning a natural process, however, appear to be sufficiently universal to make this way of learning a powerful one for all children, though not an exclusive one. What, then, can teachers do to provide the conditions in which the creative thinking abilities have a predominant role?

Provide Opportunities for Creative Behavior

One of the most obvious ways of providing conditions for creative learning is to offer a curriculum with plenty of opportunities for creative behavior. This can be done in many ways. It can be done by making assignments which call for original work, independent learning, self-initiated projects, and experimentation. It can be done daily by the kinds of questions teachers ask in

class and by the kinds of problems used for discussion. One study showed that over 90 percent of the questions asked by teachers of junior high school social studies courses called only for recall. Few questions called for any kind of productive thinking. Some of the new curricular materials now being developed in the form of workbooks and audio tapes and recordings will make it easier for teachers to provide opportunities for creative learning. Essentially, these materials provide progressive warm-up experiences, procedures which permit one thing to lead to another, and activities which make creative thinking both legitimate and rewarded.

The research evidence in favor of deliberate efforts to improve the quantity and quality of creative thinking are quite impressive (see Nos. 6, 10, 15, 17, 18, 20, 22, and 23, Selected Research References, and Nos. 12 and 13, General References). Amazing records of invention, discovery, and creative solutions have been compiled through such deliberate methods as brainstorming or creative problem solving, synectics (a method of creative problem solving based on the idea that creative efficiency can be increased markedly if people understand the psychological processes by which they operate and that in the creative process the emotional component is more important than the intellectual, the irrational more important than the rational), and bionics (a somewhat similar method which relies heavily upon analogies to biological and electronic phenomena as a source of generating new ideas). The evidence from a number of experiments in educational and industrial situations also supports the value of such methods. Thus, the use of curricular materials which familiarize children with the nature of the creative thinking process through the lives of eminent creative persons and develop skills in the use of analogy would seem to be justified.

Develop Skills for Creative Learning

Learning in creative ways requires certain skills not required in learning by authority—the skills and strategies of inquiry, creative research, and creative problem solving. Interested readers will find useful materials in Nos. 6, 10, 14, 15, and 18, Selected Research References, and Nos. 10, 12, 14, 15, and 16, General References.

Reward Creative Achievements

Educational research has indicated repeatedly that people tend to learn along the lines they find rewarding. If we want children to think creatively, we must learn how to reward creative behavior. We reward children not only through grades but also through the kinds of behaviors we encourage or discourage and by the way we respond to the curiosity needs of children and young people.

We need to be respectful of the unusual questions children ask. Nothing is more rewarding to the curious child than to find the answer to his question. Although lengthy delays are unnecessary, it is important to enrich the period between the question and the answer.

We must be respectful of the unusual ideas and solutions of children. Children who learn in creative ways will see many relationships that their teachers miss. Thus, the ideas presented must be evaluated before being dismissed.

We need to show children that their ideas have value. This is done by listening to their ideas, considering them, testing them, using them, communicating them to others, and giving them credit for their ideas.

We need to provide opportunities and give credit for self-initiated learning. Overly detailed supervision, too much reliance upon prescribed curriculums, failure to appraise learning resulting from the child's own initiative, and attempts to "cover" too much material with no opportunity for reflection interfere seriously with such efforts.

We also need to provide chances for children to learn, think, and discover without threats of immediate evaluation. Constant evaluation, especially during practice and initial learning, makes children afraid to use creative ways in learning. The making of honest errors during the early stages of learning should be made less damaging to the child's record.

Provide for Continuity of Creative Development

The discontinuities in creative development that occur at about age five, the fourth grade, and the seventh grade in the United States have already been noted. Comparative studies in cultures

outside the United States suggest that these discontinuities are culturally determined and are due primarily to discontinuities in our culture and in our educational programs.

For healthy creative development, it appears that the creative imagination must be energized and guided from birth. If it is stifled early, as in Western Samoa and in some of the subcultures of India, it will become imitative or mediocre, if it survives at all.

Establish Creative Relationships with Children

All efforts to establish conditions for creative learning may fail unless classroom teachers are able to establish creative relationships with children. The term *creative relationship* seems appropriate because the desired kind of relationship takes place in much the same way as does creative thinking. The creative relationship between the teacher and pupil requires a willingness on the part of the teacher to permit one thing to lead to another, to embark with the child on an unknown adventure. It is also like the creative thinking process in that the teacher may work hard to establish this kind of relationship, may fervently want it, and still may fail. Then suddenly, it seems to "just happen." The teacher has to be ready to accept the relationship when it "happens," just as the inventor or scientific discoverer has to do. This aspect of the relationship, if nothing else, makes it vastly different from what is frequently referred to as permissiveness in education. The environment created by the teacher is definitely a responsive one in which the child finds adequate guidance.

Other Things Teachers Can Do

Although each teacher must evolve his own unique ways of teaching, experimental studies show that the following principles or procedures have positive value in facilitating creative behavior.

1. *Give purpose to creative writing.* A number of studies have exploded the assumption that creative writing skills are developed by requiring a theme a week. Experiments in which one condition involved the writing of a theme a week which was carefully corrected and the other involved considerable reading and practically no composition work have generally given a slight, though not statistically significant, edge to the reading group, insofar as

composition writing is concerned. There is a difference in writing something to be corrected and writing something to be communicated.

2. *Provide experiences which make children more sensitive to environmental stimuli.* One experiment shows that children can increase the clarity and vividness of their perceptions of sensory stimuli and that this affects the quality of their creative writing. Over a 10-week period, one group practiced writing vivid descriptions of pictures which they had studied; the second studied literary models containing words of sound, color, and movement; the third practiced describing all of the possible sensations, such as sight, smell, touch, and hearing, that they could experience in examining an object or situation. The third group showed significantly greater gains on composition tests than did the other two groups.

3. *Develop a constructive attitude toward the information taught.* In three different experiments, students who assumed a constructive rather than a critical attitude toward available information were able to produce a larger number of creative solutions and more original ones. One of these experiments involved the reading of research articles and a second, textbook material. In both, one group was asked to read material with a critical attitude, identifying defects; and the other was asked to read the material with a creative or constructive attitude, thinking of other possibilities, applications, and the like. In the third experiment, information about an industrial problem was given to participants in an industrial training program. Critical and constructive attitudes were engendered in a similar manner with similar results.

4. *Provide adequate warm-up for creative activities.* Experiments involving various kinds of "mind-stretching" activities have repeatedly demonstrated the value of warm-up experiences (see Nos. 10 and 17, Selected Research References).

5. *In warming up pupils for creative thinking, avoid giving examples or illustrations which will freeze or unduly shape their thinking.* In many cases, the giving of examples establishes expectations which are difficult to break. This makes it difficult for pupils to get away from the obvious and commonplace in their thinking. Experiments involving creative thinking tests show

that giving examples tends to increase fluency and to reduce originality. An experiment involving the making of puppets in an art class showed that the giving of examples by the teacher reduced the originality and variability of the puppets produced by the class.

6. *Avoid giving evaluative comments too frequently during practice problems or activities.* One experiment showed no difference in the effects on the subsequent creativity of three types of evaluated practice (criticism and correction, suggestions of other possibilities, and a combination of these two). Too frequent use of evaluation, regardless of the type, interfered with learning and resulted in lower performance on the test task.

7. *Provide unevaluated ("off-the-record") practice.* Young children are sometimes unproductive in responding to tests of creative thinking until they are urged to give their ideas "just for fun" or assured that "this doesn't count." In one experiment which involved two practice periods, each followed by a test task similar to the practice task, it was found that unevaluated practice led to more creative performances on the test tasks than did evaluated practice. This principle, however, seemed to be more important in grades 1 through 3 than in grades 4 through 6.

8. *Avoid the use of critical peer evaluation during practice sessions, especially above the third grade.* In an experiment similar to the one just mentioned, creative or constructive evaluation (pointing out other possibilities) rather than critical evaluation (pointing out defects to be corrected) by classmates was more effective in producing originality, elaboration, and sensitivity in grades 4 through 6, but not in kindergarten through third grade.

9. *Within heterogeneous classes, use homogeneous rather than heterogeneous groupings occasionally to reduce the social stress among members of small groups working on creative group activities.* In experiments with groupings within classes based on either tests of creative thinking or tests of intelligence, this conclusion was supported. In the homogeneous groups there was less disruptive interaction and more positive, cooperative interaction than in heterogeneous groups. Under homogeneous grouping, low ability pupils were more productive than were low ability pupils in heterogeneous groups.

10. *To evoke originality in thinking, make it clear that such thinking is expected and will be rewarded.* On tests of creative thinking, children produce more original ideas when the instructions urge that they think of ideas that no one else in the class will think of or otherwise make it legitimate for them to produce original or unusual ideas. In writing imaginative stories, children write stories which are rated as more original and more interesting when they are instructed to write such stories than when they are asked to write imaginative stories, paying careful attention to correctness. This illustration is also exemplified in one industrial organization whose research section had had no patents for some time. The manager expressed his disappointment concerning this record and the employees said, "Why didn't you tell us this is what you want?" After this, there was for some time a regular outburst of inventions and patents from this organization.

WHAT ARE THE MOST COMMON BLOCKS TO CREATIVE DEVELOPMENT?

Although a great deal of research remains to be done concerning the inhibitors and facilitators of creative development, a few of them appear clear.

Inhibitors in Early Childhood

Perhaps the biggest task in nurturing creativity during the preschool years is to keep alive fantasy until the child's intellectual development is such that he can engage in a sound type of creative thinking. The trouble is not that the child is eager to give up his fantasy, but that there are pressures upon the child from all sides to be realistic and to stop imagining. At least since the early 1900's, investigators have been rather consistent in their recommendations concerning appropriate action, but the evidence indicates that the influence of these recommendations has been negligible.

Frequently investigators have also called attention to the stifling effects of "holding back operations," such as preventing

children from learning more than they are "ready" to learn, attempting prematurely to eliminate fantasy, and overemphasizing sex roles.

Blocks During the Elementary School Years

Teachers face truly difficult problems in coping with the blocks to creative thinking during the elementary school years. Social expectations of what kind of behavior should or should not be permitted are powerful. The traditions of punitive approaches to education also greatly influence teachers. One of the difficulties of the teachers is to reconcile spontaneity, initiative, and creativity in the classroom with the maintenance of discipline. Teachers frequently find creative children threatening to their status and security and disconcerting to classroom procedures. Some of the promising concepts now undergoing experimental testing may help teachers resolve their dilemmas. These include provisions for student's self-initiated learning, learning on one's own, a responsive environment rather than just a stimulating one, revisions of readiness concepts, the development of more realistic and favorable self-concepts, recognition of the uniqueness of the individual, and the development of the roles of specialists such as counselors, psychologists, and social workers.

The social forces most frequently mentioned by investigators as blocks to creative development include an extremely peer-oriented culture which emphasizes conformity to peer-group

norms in behavior, sanctions against questioning and exploration, a success-oriented culture which makes errors fatal and makes children afraid to take a chance on trying a new approach, over-emphasis or misplaced emphasis on sex-role differences, the equation of divergency with abnormality or delinquency, and a sharp division between work and play. A few positive approaches proposed for testing are learning to reward a greater variety of abilities and kinds of achievement, helping children recognize the value of their creativity, teaching children the skills of inquiry and research, developing a creative rather than a cynical acceptance of limitations, helping highly creative children to become less difficult, developing school pride in the creative achievements of its pupils, providing sponsors and patrons for highly creative children, and helping highly creative children learn to cope with the fears and anxieties which may block their creative functioning.

Blocks During the High School and College Years

Most of the blocks present during the elementary period are also present during the high school years. Studies of adolescents have provided additional clues concerning other blocks within families which do not value or understand creative youngsters; in the adolescent culture which may place its greatest values on athletic prowess, being a "ladies' man," or achieving high grades; the values of teachers on conformity, security, "playing it safe," and completing work on time; emphases on conventional career choices; and popular but erroneous images of the creative scientists. Unusual strides have been made during the past six years on the development of curricular materials especially in the sciences and mathematics, which place much emphasis upon discovery, thinking, and imagination.

The most frequently mentioned blocks to creativity at the college level include *overemphasis* upon the acquisition of knowledge, memorization of facts, and finding already known answers to problems; the closely prescribed curriculum and bookkeeping system of credits; over-reliance upon textbooks and trust in authority; sacrifice of deep and genuine involvement to the coverage of subject matter; the lecture system of teaching; postponement

for a readiness which never quite arrives, departmentalization and vested interests; expertness and specialization; the conviction that education should use only materials which are true, moral, or artistically excellent; mechanization and loss of intimacy between teachers and students; the conviction that education should be made as easy as possible; and the low prestige in our society of scholars, teachers, and research workers.

HOW MAY TEACHERS UNDERSTAND AND INCREASE THEIR OWN CREATIVITY?

Almost no research has been directed to the problem of helping teachers understand and increase their own creativity. Regardless of whether or not it takes a creative teacher to develop creativity in others, it is still important that teachers understand and learn how to increase their own creativity. Perhaps nothing would do more to improve the mental health of the teaching profession and to increase the satisfaction of teachers with their jobs than to raise the level of their creative functioning. It is likely that most of the environmental conditions already discussed might be applied by teachers in understanding and increasing their own creativity. In addition, however, there are forces within the teacher which must be understood and dealt with.

Common Difficulties in Producing Original Ideas

As a teacher-training procedure, the present author and his associates have used with over 3,000 teachers and student teachers a set of materials entitled "Sounds and Images" which have built into them several features which have been found in other studies to facilitate the production of original ideas. Essentially, the materials consist of four sound effects to be used as the basis for producing word pictures or images. This set of four sound effects is repeated three times, and the listener is urged each time to push his imagination further and further to produce original word pictures. In some groups, we have discussed with participants the difficulties they experienced. In others, we have

asked the respondents to list individually the difficulties they experienced. The following quite commonly recognized difficulties have also been reported by eminent creative persons and by others who have studied the creative thinking process.

1. *Difficulty in finding words to describe original images.* Original ideas or images are frequently too complex to put into words. Not all creative insights can be or need to be expressed in words. Human beings respond creatively in many ways. To the pianist, the sculptor, the dancer, the surgeon, the mechanic, ideas burst into awareness in kinesthetic form, feeling their way into various kinds of muscular expression. Fingers "itch" to play; music "flows" from hands; ideas "flow" from the pen. Some participants wanted to express their images by visual rather than verbal symbols.

2. *Inability to let the imagination "go," to laugh, to play with new ideas and materials.* After all, teachers are grown-ups. They are persons of status and must remain dignified. Many cannot permit themselves to laugh or giggle "like children." Eventually, almost all of the groups engaged in some laughter, but some of them were far more grim than others. Groups of student teachers generally proved to be the most restrained. Many students of creativity believe that the ability to regress (laugh, imagine, play, have fun) is an important characteristic of the creative person.

3. *A tendency to analyze rather than synthesize.* Generally, teachers have been trained to analyze complex phenomena. The emphasis in creative thinking, however, should be on synthesis rather than analysis. We are prone to use the microscope and radar freely, to take things apart, to be scientific. Synthesis, however, is just as scientific as analysis. Analysis is useful in identifying defects; synthesis is necessary in pushing forward to a new structure or possibility.

4. *Too quick syntheses before all of the facts have been taken in.* In the sessions with teachers, many formed an image from the first element of the sound effect. As other elements followed, they were unable to unfreeze their first image and incorporate all of the elements in a unified image. This is why it is important that teachers permit themselves to experiment with new materials, ideas, and experiences. Teachers, like their pupils, should not

feel that they have to be absolutely correct the first time, and thus miss the constant testing and revision necessary for sound creativity.

5. *Difficulty in freeing oneself from an earlier image.* Some of the participants who made too quick syntheses were able to abandon the inadequate image and form a new one. Others were not. Some of them were so concerned about certainty and accuracy (what the sounds actually were) that they were unable to think creatively. A need for security or safety makes it difficult to get away from the obvious and commonplace.

6. *Fear of "going too far out" in the imagination.* With each successive playing of the sound effects, the participants were urged to stretch their imaginations further and further. A majority of them expressed a preference for their responses to the second rather than the third presentation of the sound effects. Some were afraid that they had been too imaginative. Others refused to be pushed further and only elaborated upon the first or second images produced. Some were afraid to let other members of the group see their responses to the third presentation of the sounds, lest their sanity be questioned. The fear of being an individual, of being oneself, is widely recognized as a serious block to creative thinking. It takes courage to be oneself, to think one's own ideas. Highly creative persons are not conformists in their ideas, neither are they deliberate nonconformists. Instead, they are genuinely independent in their thinking. This does not mean, however, that they are always confident about their ideas. Even the most eminent creative individuals experience feelings of doubt and misgiving.

7. *Distraction caused from having to think in a large group.* Many creative people find that they must be alone in order to think through problems and come up with original and useful solutions. Apparently, creativity may take both working with others and working alone. There are times when teachers may have to get away from social distractions and avoid interruptions to think of a creative solution to a nagging problem.

8. *Too great a flood of ideas.* A frequent complaint of participants was that they had difficulty in writing down any image because they had too great a flood of ideas or images. This is known by creative people as "the avalanche effect" and calls for

a peculiar kind of control. Creative energies must not be permitted to waste themselves. They have to be directed, slowed up, stopped, or thinned out at times. To achieve something important, the creative person has to select a small number of ideas and work them out. Some ease the tension by "trapping" for future use the ideas they cannot use at the moment by writing them down and filing them away.

9. *Inability to summon the right mood.* Some participants said that they could not produce original ideas because they were not in the mood. To know the secret of one's best moods and how to bring about this mood is important in the teacher's search for creativity within himself.

10. *Physical strain and inability to assume the bodily posture most conducive to creative thinking.* A frequent complaint in the group sessions was that it was not possible to stretch out, lie down, draw their feet up, or assume some other bodily position personally conducive to creative thinking. It is fascinating to watch or to photograph children in the process of taking tests of creative thinking or engaging in other creative activities. Their entire beings seem to be involved in the process. As they grow older, these unusual bodily postures are not noticeable during creativity tests and experiments. Another complaint concerned the restriction against walking around. Apparently, many people find that one way to get ideas started is to take a walk or to pace about. The stirring up of purely physical energy seems to aid in the warm-up process. Many writers and students report that when they have difficulty in getting started on a project they can sit down and start typing or writing whatever comes into their minds, and soon worthwhile ideas begin to develop and good writing follows.

11. *Lack of a good memory or rich background of reading and experience.* Participants in our sessions sometimes attributed their ability to think of original ideas to their good memory or rich background of reading and experience. Since originality depends upon new and striking combinations of ideas, it is reasonable to expect that the more ideas or images one has available, the better are one's chances of coming up with original ideas. Many scientific discoverers and highly creative people in other fields have

been noted for the broad scope of their knowledge in fields outside their own. The ability to think in terms of analogies seems to be especially important.

12. *Preoccupation with worry.* Many participants confided that they were preoccupied with some worry and could not fix their attention on the problem. This is a problem to even the most creative persons. Many highly creative people are extremely sensitive, and worries about everyday affairs intensely affect their creative work. Some trivial or tiresome duty may make even a highly creative teacher unproductive.

13. *Running out of ideas after the first series.* A few complained that they had no difficulty in producing responses to the first presentation of the stimuli, but were unable to think of any more. People accustomed to the one-correct-answer approach rather than thinking in terms of possibilities have this difficulty. They have been conditioned to think of one solution to any problem—usually the most obvious, safest possibility—for them, "this is it." Thinking of this one solution seems to close their minds, and they are unwilling to entertain any other possibilities. The creative person, however, is able to think in terms of possibles. For every failing experiment, Edison had several ideas for new experiments. Clement Attlee once said of Winston Churchill that in conferences, no matter what problem came up, Churchill always had about 10 ideas on how to deal with it.

WHAT SHOULD BE THE GOALS IN GUIDING CREATIVITY?

Understanding, measuring, and developing the creative thinking abilities are part of the educator's great dream of achieving a more humane kind of education in which every child will have a better chance to achieve his potentialities. It is of obvious importance to society that creative talent be identified, developed, and utilized. Already, the understandings derived from research concerning the creative thinking abilities have broadened our concepts of "giftedness" from that of the "child with the high IQ"

to include also the highly creative child and perhaps other types. It is becoming increasingly clear that nothing can contribute more to mental health and the general welfare of our nation and to the satisfactions of its people than a general raising of the level of creativity. There is little doubt that the stifling of creative thinking cuts at the very roots of satisfaction in living and eventually creates overwhelming tension and breakdown. Research in progress suggests that it is important that creativity be energized and guided from birth. If it is stifled early, it will only become imitative, if it survives at all. It is true that vigorous creative imagination can survive early stifling and opposition; but if it learns only to act vigorously without direction, it becomes dangerous to society and perhaps to civilization.

It has already been pointed out that the creative thinking abilities are important in the acquisition of even the traditionally measured kinds of achievement when children are permitted to achieve some of these goals in creative ways. Their importance in vocational success has also been mentioned. Goals become clearer and more urgent, however, when we look upon the creative thinking abilities as just one part of our expanded and expanding concept of the human mind and its functioning. An acceptance of this broader concept of the human mind opens up many new and tremendously exciting possibilities for teachers. It places a new emphasis upon consideration of what man may become. It suggests that we can educate to a higher degree many people whom we have not been very successful in educating. As we have begun to understand more deeply the creative functioning of the mind, the case for learning creatively rather than just by authority has been strengthened. This may soon enable us to learn what it really means to individualize instruction.

No matter how successful research becomes in determining methods of identifying and developing creative talent in the child, teachers must never forget that the very life and function of creativity is to go courageously into the darkness of the unknown. This involves ever searching for the truth and living honestly. We shall be handicapped in achieving such a goal as long as we condition children to authority acceptance and dishonesty in the home, school, church, and government. The truly creative person, the kind of creative person that we need so

urgently, must be able to make judgments independently and stick to them, even though most others disagree. It must be remembered that every new idea in the beginning always makes its originator a minority of one. It is well known from research that being a minority of one is tremendously uncomfortable and more than most people can tolerate. Thus, creativity takes great courage.

Unfortunately, the results of research are not encouraging when it comes to attitudes about the importance of courage. Teachers and parents in the United States do not give a place of great importance to either independence in judgment or courage, according to what they consider an ideal pupil. The present writer developed a check list of 62 characteristics based on over 50 empirical studies which differentiated some groups of creative persons from their less creative peers. This check list has been submitted to over 1,000 teachers in different parts of the United States and to groups of teachers in several other countries. Respondents were asked to indicate the degree to which they believe each characteristic should be encouraged or discouraged. In the list of 62 characteristics, courage ranks thirtieth. From the results, it would appear that it is more important to teachers in the United States that their pupils be courteous, do their work on time, be energetic and visibly industrious, be popular and well liked by their peers, be receptive to the ideas of others, be well rounded, and be willing to accept the judgments of authorities than to be courageous. Obviously, such a pattern of values is more likely to produce a people ready for brainwashing than one able to resist it and to think creatively.

The characteristic rated at the top of the list by both parents and teachers in the United States is "consideration of others," certainly a valuable one. This preoccupation with consideration of others or politeness has been noted by a number of foreign observers who have lived in the United States. In their experiences, they found that this preoccupation causes us to be dishonest in our dealings with others and with each other. It causes us, in politeness, to promise things which we have no intention of doing. The characteristics of eminent creative persons as revealed through research would certainly suggest that anything which conditions children for dishonesty endangers creativity.

CONCLUSION

The author hopes that he has not conveyed the idea that research has solved all of the puzzling phenomena about creativity. To do so would be the grossest of errors. There are many more questions that need to be answered before we have an adequate scientific base for guiding creativity in the classroom. It is the author's conviction, however, that we know enough from research to enable us to do a far better job than we apparently do in achieving even the most widely accepted goals of education. No matter how much we learn from research, the individual teacher's way of teaching must be his own unique invention. He must arrive at this personal invention through his own creative processes in trying to accomplish his teaching goals. As he fails or succeeds in reaching these goals, he becomes aware of his deficiencies, defects in his techniques and strategies, and gaps in his knowledge. He draws upon his past experiences. He increases his search for clues in his ongoing experiences. He tries to apply creatively the scientifically developed principles he has learned in his professional education and reading. He sees things of which he has hitherto been unaware. He starts making some hypotheses, testing, and modifying them. Through the pain and pleasure which accompany this process, the teacher's personal invention—his way of teaching—evolves.

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